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CBIS INTERNATIONAL GROUP

TECHNICAL SPECIFICATION

OF

OIL STORAGE TANK AUTOMATIC CLEANER

(APRIL 2021)

RESTRICTED

Gültepe Mah. Çimenli Sokak 24/33 Altındağ-Ankara

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ABBREVIATIONS

OSTC: Large Oil Storage Tank Cleaning Equipment

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1. System Name:

Oil Storage Tank Automatic Cleaner

2. System Owner:

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3. Technical Information:

During the storage period of oil, inorganic, asphaltine, paraffine, and other heavy oil components are to be sedimentated to the bottom of oil storage tank by the effect of gravity, and become black, viscous and gelatinous sludge, which take up lots of space of the storage tank. Further, the oil storage tank should be overhauled every 5-7 years, and before overhaul and exchange the sort of oil, the tank have to be cleaned first.

Along with the upsizing of the oil storage tank, the traditional manual tank cleaning can not satisfied the production requirement, because manual tank cleaning is general speaking a tedious and cumbersome process that putting both personnel and property at risk.

Therefore, to keep up with the best, tank farms, refineries, and tank cleaning service providers, who are looking to automated, non-man entry methods as a viable alternative.

a. Benefits:

Efficient: GM system integrating desludging, tank cleaning and oil recovery in one process, which reduces to 80 percent tank down time.

Environmental: Totally enclosed working process, minimises hydrocarbon emissions and substantially reduces liquids and solid waste.

Safe: Operators do not enter the tank, to avoid risk of explosion, an inert gas-typically nitrogen is injected into the tank and maintained oxygen level to below 8 percent throughout the entire cleaning process.

Economical: Recover 98 percent oil in the sludge, reduce the overall cleaning costs.



Oil Storage Tank		Light Oil Storage Tank	
Tank Volume (m3)	Cleaning Time (Day)	Tank Volume (m3)	Cleaning Time (Day)
10K	18	1K	8
20K	20	2K	8
30K	22	3K	8
50K	25	5K	10
100K	40	10K	15

Table 1: Construction Period

Tank Capacity (m3)	Amount of Sediment (m3)	Crude Oil Weight (T)	Recovery	Recovery Efficiency (USD)
10K	300	255	98%	183K
20K	650	550	98%	397K
30K	850	720	98%	519K
50K	1400	1190	98%	855K
100K	2500	2125	98%	1526K

Table 2: Oil Recovery Efficiency

b. Process and Features:

The cleaning cycle is established with the medium of oil and/or water. By 3D cleaning nozzles fixed on the roof of to-be-cleaned tank or man-hole on the wall of to-be-cleaned tank, the cleaning medium is jet into to-be-cleaned tank, hence the oil sludge is broken, fallen and dissolved. As soon as oil sludge regains liquidity, they will be vacuum sucked out for three-phase separating, so as to recycle oil, 're-use oil slag while purified water discharged. By solid-liquid separating and water-oil separating, the separated water goes back for continuous tank cleaning and separated oil is recycled, until the tank is completely cleaned.



c. Cleaning Process:

The water-oil mixture in to-be-cleaned tank is sucked to vacuum tank through coarse filtering, and then pumped to water-oil-separating-trough. The 25 com water-oil-separating-trough makes the water-oil,-mixture separates in relatively short time, that upper layer is waste-oil with little water while lower layer iswater with little oil. The water in lower layer is pumped to double filter for fine filtering, then swirl-decreasing, heating, pressure boosting and back to cleaning nozzle.

The process is brief as: to-be-cleaned tank → double filter →vacuum tank → self-cleaning filter → water-oil-separating trough → supply pump →double filter → swirl centrifuge → heat exchanger → pressure boost →cleaning nozzle →to-be-cleaned tank

d. Vacuum Suction Process:

A liquid-ring-vacuum-pump is adopted to generate 22 bar vacuum, which ensures strong and stable vacuum suction, smooth and continuous cleaning. The vacuum sucked oil-gas returns to to-be-cleaned-tank, without air pollution at the site, while the inert gas environment in to-be-cleaned-tank is maintained.

e. Solid-Liquid Separation Process:

The big-sized particles discharged by the self-cleaning filter go to decanter solid-liquid centrifuge, then the separated mud and slag will be discharged to transport cart, while the separated liquid, including water and waste oil go back to water-oil-separating trough for recycling and recovery.

f. Water-Oil Separating Process:

Once the level of water-oil-separating trough goes up to a certain number, the skimming pump starts to deliver the floating oil to high-speed water-oil separator. After separating, the wasteful could be barreled for re-use, and the water goes back to water-oil-separating trough.



g. Nitrogen Process:

200 m³/hr Nitrogen at 99% purity is generated and injected into to-be-cleaned tank, in order to keep the oxygen concentration lower than 8%. The screw compressor provides compressed air for pneumatic devices. After oil tank cleaning, Nitrogen will be used to blow whole system dry, including all pipes and various equipment.

h. Advantages:

GM System adopted with safe, environment-protective and efficient technology becomes one of the most advanced oil tank cleaning equipment, with following advantages:

1. Highly modular system with integrated design.
2. Highly efficient cleaning with long range and shortened cleaning time.
3. Highly automatic control and monitor with zero-man entry into the tank.

Highly maximized environment protection and oil recycling with efficient and reliable STA



. The Type and Component of the Storage Tank Auto Cleaner:

- Type I CBIS STAC, Component List

No	Name	Parameters	Quantity
1	Oil Recycling Device	300 m ³ /h, 54 m	1 Set
2	Oil Cleaning Device	180 m ³ /h, 75 m	1 Set
3	Cleaning Nozzles	Diameter 76 mm	30 Sets
4	Gas Monitoring Device	6 Block Remote Monitoring	1 Set
5	Water-oil-separating Equipment	25 m ³	1 Set

Table 3: Nucleus Equipment

No	Name	Parameters	Quantity
1	Nitrogen Generator	90 KW, 330 m ³ /h	1 Set
2	Pneumatic Diagram Pump	Type 50	2 Units
3	Pneumatic Diagram Pump	Type 80	1 Unit
4	Air Compressor	15 KWan, 0.8 MPa	1 Unit
5	Filter	DN500×2	2 Sets
6	Switch Board	400A Explosion Prevention	1 Set
7	Valves	Pressure-Bearing 1 MPa	1 Set
8	Cable	150 mm ²	2 Sets
9	Pressure Piping	Pressure-Bearing 1 MPa	1 Set
10	Flexible Pipe	Pressure-Bearing 1 MPa	1 Set
11	Protection Article	/	1 Set
12	Ancillary Equipment/Tools/	/	1 Set

Table 4: Corollary Equipment

**- Type II CBIS STAC, Component List**

No	Name	Parameters	Quantity
1	Oil Recycling Device	OJTC-II	1 Set
2	Top Cleaning Nozzles	CGPQ-70	1 Set
3	Sidewall Cleaning Nozzles	GM-76	30 Sets
4	Gas Monitoring Device	Remote Monitoring	1 Set
5	Water-oil-separating Equipment	25 m ³	1 Set

Table 5: Nucleus Equipment

No	Name	Parameters	Quantity
1	Nitrogen Generator	55 kW, 200 M ³ /h	1 Set
2	Switch Board	400A Explosion Prevention	2 Units
3	Centrifugal	35-50 m ³ /h, Hand Propelled	1 Unit
4	Air Compressor	15 kW, 0.8 MPa	1 Unit
5	Filter	DN500x2	2 Sets
6	Explosion Prevention Blower	1.1 kW	1 Set
7	Pressure Piping	Pressure-Bearing 1 MPa	1 Set
8	Flexible Pipe	Pressure-Bearing 1 MPa	2 Sets
9	Valves	Pressure-Bearing 1 MPa	1 Set
10	Filter	2xDN500	1 Set
11	Protection Article	/	1 Set
12	Ancillary Equipment/Tools	/	1 Set

Table 6: Corollary Equipment

4. Technical Properties of Large Oil Storage Tank

a. Equipment Description

- Operation Principle

Large oil storage tank cleaning equipment (OSTC) can remove the oil sludge/ recover the crude oil and clean the inner wall.

The spray guns are inserted into the storage tank through support holes. Two guns spray the same oil to crush and dissolve the sludge at a time, then the oil recovery component transfer the liquid oil to the receiving tank.

After all sludge is crushed and recovered, the guns spray the heated water to clean the inner wall and floating roof.

During the whole cleaning process, the O₂ concentrations in the tank is kept less than 8% by filling nitrogen and monitored at all times by O₂ Monitor, so that the fire and explode danger can be eliminated.

There will be little residue as inorganic solid, iron filings and sands, after cleaning.

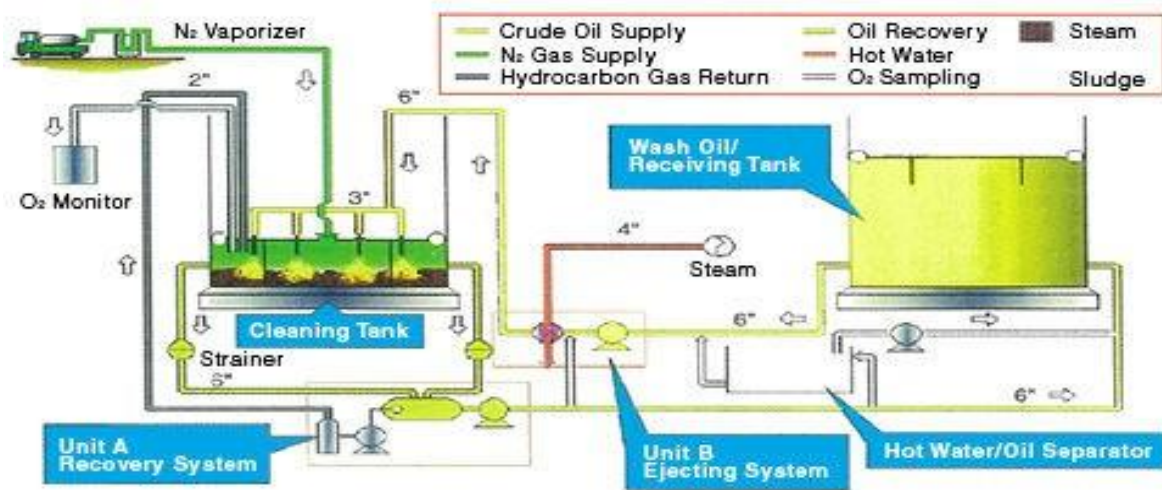


Figure-1: Large Oil Storage Tank Cleaning Process



Compared with manual cleaning, the OSTC is more safe, efficient, environmental cost-effective, and etc.

- Components

The OSTC equipment can meet the 24 hours continuous work. All main components are prizing base types which are good for highway transportation and loading. The OSTC equipment consists of main units and auxiliary units.

ITEM	COMPONENTS	DESCRIPTION	QTY	REMARK
MAIN UNITS				
1	Recovery System	300m ³ /h, 54m	1	
2	Ejecting System	180m ³ /h, 80m	1	
3	Spray Guns	Dia. 76mm	30	
AUXILIARY UNITS				
1	Nitrogen	90kW, 330 m ³ /h	1	
2	O2 Monitor	7 Points	1	
3	Oil Separator	25 m ³	1	
4	Cable	3×120, 3×70	600m	
5	Switch cabinet	Anti-explosion	1	
6	Pneumatic Diaphragm Pump	50 Model	2	
7	Pneumatic Diaphragm Pump	80 Model	1	
8	Compressor	15kW	1	
9	Tube & Pipe Assy.	1MPa	1	Flange, Tee, Elbow, etc.
10	Hose	1MPa	1	
11	Valve	1MPa	1	
12	Filter		2	
13	Labor Protection Appliance		1	
14	Accessories & Tools		1	

Table 7: Components

- **Description of Main Units**

1) Recovery System

The Recovery system is used to:

- Transfer the oil from the cleaning tank to the receiving tank;
- Transfer the liquid oil formed through that the sludge is crushed and dissolved to the receiving tank;
- Transfer the heated water to the oil separator during heated-water cleaning;

The recovery system consists of: pump unit driven by motor, vacuum pump unit, vacuum vessel and system, control system, pipelines and valves, and etc. The power is 75kW, the maximum delivery is 300 m³/h, the volume of vacuum vessel is 3.2 m³, the pressure is -200 ~ 400 mmHg.



Figure-2: Recovery System

2) Ejecting System

The ejecting system is used to:

- Pump and pressurize the same oil from the receiving tank, and then transfer to the spray guns for crushing and dissolving the sludge;
- Pump and pressurize the heated water from the oil separator, and then transfer to the spray guns for inner wall and floating roof cleaning;
- Through changing the pipelines and valves, transfer the rest oil from the cleaning tank to the receiving tank.

The ejecting system consists of: boost pump unit, heat exchanger, control system, pipelines and valves, air compressor, and etc. The power and flow of boost pump unit are 75kW and 180m³/h. the heat transfer area of heat exchanger is about 35m², the pressure is not less than 1MPa.



Figure 3: Ejecting System

3) Spray Guns

The spray guns are used to:

- Spray the same oil to crush and dissolve the sludge;
- Spray the heated water to clean the inner wall and floating roof;

The spray guns consist of: driving components, reserving components, spray pipe components, control components, and etc. The effective range is 15m and 0~135°.



Figure 4: Spray Guns



Figure 5: Spray Guns Test

b. Project & Application

From 2011 – 2012, the Chinese manufacturer have finished many projects of 50,000 m³ and 100,000 m³oil storage tank mechanized cleaning, and achieved the customers' approval.



Figure 6: Installation Site



Figure 7: System Layout

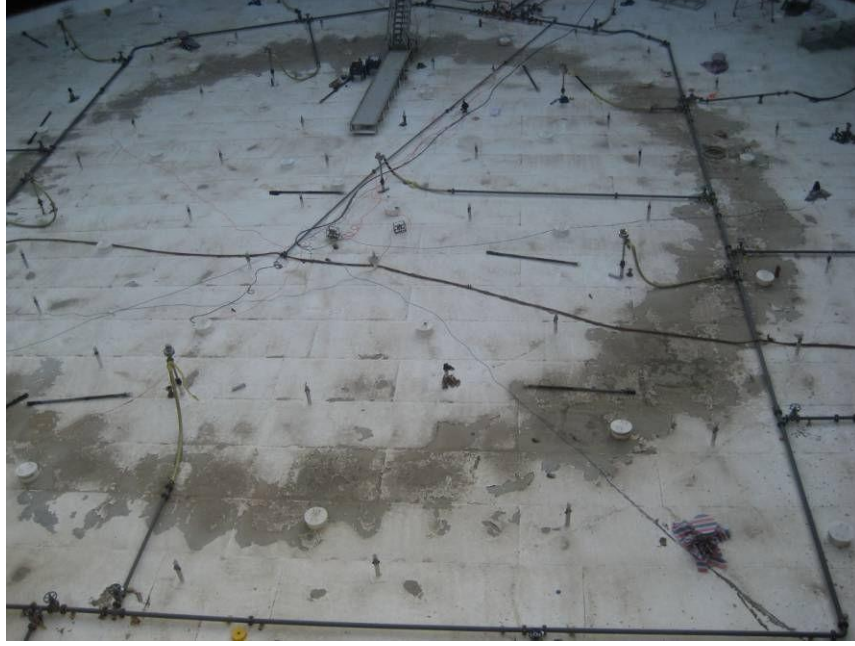


Figure 8: System Layout on Floating Roof



Figure 9: After Cleaning